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Guest editorial: Special issue on bio-tribology

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Tribology plays an important role in engineering as well as in animal world and our daily life. Since the first introduction in 1970 [1], bio-tribology has been widely researched. More recently green tribology has also received significant attention with the special attention to our environment and energy consumption.

This Special Issue of ***Friction*** is intended to introduce readers to the exciting fields of bio-tribology, covering not only the fundamental understanding of the natural biological systems but also the application to medical interventions, and green tribology. Review papers, research articles and short communication are included to demonstrate the breadth and the timeliness of the subject and to provide an opportunity for the publication of new findings. Eights papers by tribologists, scientists, biologists and physicians have been selected to achieve these aims, including three general review articles on the friction in biological systems, the adhesion and locomotion in the animal world, and the skin tribology, one research paper on the attachment and movement of animals, two papers on the subject of natural synovial joints and artificial replacements, one on the lung (pleural), and one short communication on green tribology.

The first paper by Jin and Dowson reviews the biofriction in a number of biological systems including synovial joints, eye, pleurae, fat pad, skin, and oral cavity as well as daily activities associated with shaving, brushing, slip, etc. The role of friction studies and the corresponding link with the understanding of the lubrication mechanisms have been demonstrated.

Zhou et al. reviews the recent advances in gecko adhesion and friction mechanisms and the development of gecko-inspired dry adhesive surfaces. The importance of the gecko hierarchical structures, i.e., the feet, toes, setae, and spatulae on the adhesion and friction is discussed, with the emphasis on the understanding of the corresponding models to ascertain the mechanical principles involved.

Skin tribology is addressed by van der Heide et al. The current understanding of skin tribology is still limited by the living nature of skin, subject and anatomical sites specific, and simplified test methods. Current predictive friction models have been shown to be only partially capable of predicting *in vivo* skin friction.

How animals use opposite frictional forces to increase their attachment reliability during movement is addressed by Wang et al. These opposite frictional forces allow many animals to attach securely and stably during movement. The coordination of different attachment (adhesion) modes not only helps animals adhere, but also increases the overall stability of the attachment (adhesion) system.

The synovia constituents in synovial fluids are important on the tribological behaviors of articular cartilage. Murakami et al. investigate the effect of different synovia constituents on the tribological functioning of the intact and damaged cartilage tissues, and the corresponding synergistic actions between different constituents.

The role of potential elasto-hydrodynamic action on the frictional transients in sliding mesothelial tissues in the lung is addressed by Loring and Butler. The frictional variations seen with sliding mesothelial tissues are found to be consistent with elasto-hydrodynamic lubrication without direct contact between the sliding surfaces.

Wimmer et al. consider the damage due to rolling in total knee replacement—the influence of tractive force. The importance of the rolling motion and its combination with sliding of the femoral component on the wear of the polyethylene tibial plateau is studied. Tractive rolling has been shown to be an important wear mechanism.

The closing paper by Zhang introduces the field of green tribology in a short communication, including its history, the definition, the objectives, and the disciplinary features. The technological connotations of green tribology are discussed comprehensively and the future directions of this new area are highlighted.

References

[1] Dowson D. Whither tribology. *Wear* **16**(4): 303–304 (1970)